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ASSISTANT SURGEON, WILLS HOSPITAL, PHILADELPHIA.

WITH A REPORT OF THE HISTOLOGIC FINDINGS.

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WITH A REPORT OF THE HISTOLOGIC FINDINGS.

By Dr. HAROLD G. GOLDBERG,

PATHOLOGIST OF THE HOSPITAL. (FROM THE SERVICE OF DR. SCHWENK.)

Clinical History.—A young man, a locomotive engineer, came to the Hospital on October 10, 1908, with a statement that while attending to his engine that morning the lubricating glass blew out, fragments of which struck him in the face. On examination the lids of the left eye were seen to be contused, and the globe perforated. The perforating wound passed through the ciliary region, extending obliquely from a point about 4*mm* from the vertical meridian on the nasal side of the globe upwards to near the vertical and about 3*mm* above the horizontal meridian. The edges of the wound were straight cut, but uveal tissue bulged into the lower angle. There was a shallow hyphæma. The sheet of the iris was not cut and the pupil was round. A strong solution of eserin was instilled, which caused a marked contraction of the pupil and the withdrawal of some of the tissue in the wound. The lens was not at all, or but slightly, damaged. The fundus could not be seen through the œdematous cornea.

It was presumed that a fragment of oily glass had lodged in the globe and a guarded prognosis was given; and the gravity of the case was explained to the man. He at first refused to accept the verdict, but later returned to the Hospital and was placed in bed; ice compresses were applied constantly; atropin solution was instilled and fractional doses of calomel administered.

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[1] Read at Wills Hospital Ophthalmic Society meeting, Jan. 5, 1909

After ten days the lips of the wound were still ununited, though the corneal œdema and the hyphæma had disappeared. With the mirror one could see a large and quite broad track or band of lymph extending from the lower angle of the wound across the vitreous to the temporal side of the globe.

The right eye appeared to be entirely healthy, yet the patient complained of discomfort in it. Enucleation of the wounded eye was advised, which decision was concurred in by several members of the Staff who were consulted.

On October 22d, the globe was enucleated. During the manipulations, a clear amber-colored mass forced its way through the imperfectly closed wound. To the bystanders it appeared to be the crystalline, for it was about the size and shape of a lens, but it was so compressible that I believed it to be a cystic protrusion from the vitreous.

The adhesions about the globe were many and dense. The flow of blood was quite free, and at the severance of the nerve there was a copious hemorrahge.

The patient was discharged from the Hospital after four days. The socket has since healed and the man wears a glass eye. The vision of his right eye is $\frac{6}{6}$, and he has returned to work.

The globe was dissected after the removal of it. No signs of union of the wound were seen, and no particles of glass were found. The ciliary processes were deeply infiltrated, and there were streaks of lymph stretching through the vitreous. The retina was thickly œdematous, and for an hour after the ball had been removed the blood-vessels remained engorged and distended. The nerve head was swollen and the macula was quite distinct.

Microscopic Examination.—All the layers of the cornea are intact. The surface cells are granular in character and are covered with a fine detritus. The endothelial cells have proliferated, and at the corneo-scleral junction, on one side of the section, the spaces of the substantia propria are somewhat infiltrated with polynuclear leucocytes shading off toward the anterior pole.

The anterior chamber is normal in depth and the spaces at the angles are somewhat engorged. On one side of the section the iris and ciliary processes show early cicatricial changes and proliferation of the endothelium and infiltration with polymorphonuclear leucocytes. The pupillary tip of the iris lies in contact with the anterior capsule of the lens, where it is held by a thin reticular exudation consisting of a well marked band composed of leucocytes and fine dark-brown pigment granules. This band extends completely across the pupillary area, touching the lens capsule at various points, to the opposite iris, where it seems to split and encapsulate this body.

The lens is cataractous; the external fibres have been artificially detached, but the capsule is entirely intact. The choroid is highly atrophic; the supra-choroidea is broken up and its endothelium degenerated. The pigment connective-tissue cells are inconspicuous, but the non-pigmented cells of the internal layers show evidences of proliferation and there is also a fine scattering of leucocytes in this region.

The retina is firmly attached; there is marked proliferation of the pigment epithelium, with cystic changes and thickening of the nerve-fibre layer. There is a leucocytic infiltration of the episcleral tissues on this side of the section.

On the opposite side there is a perforating wound at the corneo-scleral margin which has severed the root of the iris at its attachment to the ciliary body, thus setting the iris free in the aqueous chamber except at the point where it is attached to the lens capsule and the strip of exudation already described. This portion of the iris is wrinkled, which contributes to the general thickening caused by the proliferation of the endothelium and retinal pigment layer. Epithelioid cells are present here and also polymorphonuclear leucocytes with diversely arranged pigment cells. The same condition is noted in the ciliary body and the same character of cell structure is shown with the addition of giant cells. There is a large hemorrhage in the muscle layer, and a large mass of free blood on the internal surface. The lips of the wound at both extremities are thickened, the connective-tissue cells are proliferating, and mononuclear leucocytes and new blood-vessels are seen.

Passing through the wound is a fine reticular substance forming with the pars ciliaris retinæ a cyst-like structure. The cyst has two layers: the external, formed by the substance just described; and the internal, formed by the pars ciliaris retinæ. This internal layer appears to be so stretched out that it seems several times longer than one would expect the amount of area involved could be. This retinal membrane lies folded upon itself several times and by its continuation through the wound passes over the surface of the blood clot on the ciliary process, and takes its normal position posterior to this mass. The reticular structure is made up of a fine granular material. It seems to have been pushed through the wound by some force operating from within. Externally it reaches well on either side of the wound so that it completely covers the opening. This membrane is continuous through the wound with a similar substance spread out over the internal surface of the wound and the posterior surface of the lens, and it passes close to the root of the iris. Within the globe the structure of the membrane is well enough marked to show that it is formed by a modification of the vitreous, which body has shrunk and completely covers the posterior capsule of the lens.

It would not be wrong to say that the two lips of the wound are healed, though they are not united by at least a millimetre, for they are kept apart by the walls of the cyst. The only explanation for the production of the cyst that occurs to me is that the first factor was perhaps the hemorrhage on the internal surface of the ciliary body. This old blood clot tore up the pars ciliaris retinæ and left a space which has been filled by the products of inflammation and the fluids from the disorganized blood. An intraocular force sufficient to increase this tear pushed the membrane ahead of it and ultimately forced it through an external opening. This force doubtless continued for some time as indicated by the unhealed wound. Leaking also took place through the wound, which shows that the force was in this direction; and because of a sudden giving way of the imperfectly closed outlet the confined forces caused the extrusion of the cyst.

This supposition is further borne out by the separation of the individual cells which has been caused by the stretching of the retinal membrane, and, further, the normal channels for the exit of fluids were blocked off by the band of exudation which filled the pupillary area and by the sheet of modified vitreous. Consequently the drainage and leaking could be effected only through the wound and accordingly the greatest force tended in the direction of that region.

Clinically, the most important points to be observed are: the rather long time in which the wound continued unhealed in spite of the quiescence of the external inflammatory symptoms, and the early date at which the sound eye manifested signs of sympathetic irritation.

Pathologically, of particular note were the development of the strange cyst, which, as the histologic study discloses, contributed to the failure of the union of the wound; the formation of streaks of exudation in, and the degeneration of the vitreous; and the absence of particles of glass.

Of further importance was the very rapid destruction of the retina and choroid in so short a period of time. And it is interesting to note the relation existing between the early manifestation of symptoms of sympathetic irritation and the finding of newly formed epithelioid cells in the ciliary tissues.